Great Lakes Environmental Research Laboratory

Stewards of the Great Lakes

The Great Lakes comprise one-fifth of the world's surface fresh water supply and 95% of U.S. quantities. Intelligent care of these resources is vital to the nation's sustained economic and environmental well being.

Declining Lake Michigan water levels to near-record lows during 1999-2003 have led to widening beaches and have caused costly problems for commercial shipping, recreational boating and marinas.

Storm-driven high waves and currents in Great Lakes coastal areas pose threats to life and property and require accurate, reliable and timely forecast models to help reduce the risk and damage of such hazards.

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What does the Great Lakes Environmental Research Laboratory do for the nation?

Great Lakes Environmental Research Laboratory (GLERL) research helps protect and sustain life, property, and economic and environmental well-being in the Great Lakes and other U.S. coastal ecosystems. GLERL provides coastal constituents and decision and policy makers at all levels with an understanding of the sources, pathways, fates, and effects of toxins; of natural hazards such as severe waves, storm surges, and ice; of ecosystems and their interactions, including the threat and impact of invasive species; of changes in water levels of the Great Lakes; and of regional effects related to global climate change. GLERL's research is mandated by 12 Federal statutes, one executive order, and the U.S.-Canada Great Lakes Water Quality Agreement.

GLERL's mission is to "conduct high-quality research and provide scientific leadership on important issues in both Great Lakes and marine coastal environments, leading to new knowledge, tools, approaches, awareness and services." Key research activities include:

- Explaining and predicting changes in water resources, lake water levels, and ice cover.
- Examining measures to prevent the introduction of aquatic invasive species and to determine their impact on Great Lakes and coastal ecosystem health.
- Identifying sources, pathways, and fate of toxic contaminants and nutrients cycled through food webs in aquatic ecosystems.
- Examining the potential impact of climate change on the water quality and levels of the Great Lakes.
- Investigating nearshore hydrodynamic processes affecting the protection of health, life, property and the environment.

Recent Accomplishments:

NOAA has established a new GLERL-based National Center for Research on Aquatic Invasive Species***.*** **Payoffs: The National Center allows NOAA to more effectively organize and coordinate its aquatic invasive species research efforts while ensuring that resources are focused on priority problems nationwide.**

GLERL, in collaboration with researchers in the U.S. and Canada, is leading one of the largest, most comprehensive Lake Erie research field programs. The two-year project, *International Field Years on Lake Erie*, began in May 2005 and includes expeditions involving up to 10 research vessels, as well as field and laboratory work. Fourteen observation moorings will be deployed in the lake to continuously collect data. The project will continue through mid-October. **Payoffs: Improved understanding of processes leading to the development of anoxic "dead zones" in the central and western basins of Lake Erie will provide decision-**

makers with new tools to predict the occurrences of these events and to devise effective management strategies to diminish or eliminate them.

In August 2004, The Center of Excellence for Great Lakes and Human Health - a multi-disciplinary research center focusing on understanding the inter-relationships between the Great Lakes ecosystem, water quality and human health – was established at GLERL. The Center will focus on using ecosystem forecasting to minimize risks to human health in coastal environments. **Payoffs: Research and new forecast models will provide valuable insight into factors contributing to waterborne health threats and increased lead time in predicting conditions warranting beach closure, development of harmful algal blooms and declining water quality.**

GLERL and the Cooperative Institute for Limnology and Ecosystems Research jointly lead a $1.9M Great Lakes No-Ballast-on-Board (NOBOB) Assessment and Ballast Water Exchange Study. This three-year research effort involved collaboration between six institutions and was conducted by a U.S.-Canadian team of scientists. **Payoffs: A comprehensive project report released in May 2005 provided detailed knowledge on plant and animal communities carried in NOBOB tank sediments and residual waters, as well as threat assessments such biota pose as potentially new aquatic invasive species in the Great Lakes.**

What's next for GLERL?

Expansion of Ecosystem Forecasting Capabilities - As part of its effort to design and create reliable and accurate ecological forecasting capabilities, GLERL has consolidated its research activities into four components:

- **Physical Environment Prediction -** nearshore and open-lake hydrodynamics, water resources research, climate change and variability, episodic events research;
- **Ecological Prediction -** foodweb dynamics, long-term examination of specific foodweb components or habitat, understanding and predicting causes, effects, and solutions to problems such as eutrophication, toxic contaminants, invasive species and habitat modification;
- **Aquatic Invasive Species -** research addressing prevention of aquatic invasive species introduction, research to evaluate and understand the biology and ecological impact of aquatic invasive species; and
- **Great Lakes Observing System -** integrated long-term monitoring and assessment, Great Lake Coastwatch, and the Integrated Great Lakes Coastal Observing System.

Research Partnerships:

GLERL conducts collaborative research with over 150 research institutions at the state, regional, national and international levels. GLERL also conducts research with two cooperative institutes. The Cooperative Institute for Limnology and Ecosystems Research, established in 1989, is NOAA's only Cooperative Institute dedicated to freshwater research and promotes collaborative research between GLERL, the University of Michigan, Michigan State University and other academic institutions throughout the Great Lakes Basin. GLERL is also the host NOAA institution for the Cooperative Institute for Climate and Ocean Research (CICOR), which works with the NOAA laboratories and the Woods Hole Oceanographic Institution, focusing on coastal ocean and nearshore processes, the ocean's role in climate and climatic variability.

Budget and Staff

The fiscal year 2006 enacted budget for the GLERL budget lines totaled $8.5M. The fiscal year 2007 President's budget request for GLERL is $8.8M. GLERL currently has 57 permanent Federal employees.

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